

Space Weather Technical Forecast

Issued on Thursday, 11 August 2022 at 13:15 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Slight chance of isolated Minor Geomagnetic Storms on 11 August. Active electron fluence throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low over the past 24 hours, with one long period C1.2 flare at 11/0658UTC from the AR3077 (Cro/Beta). This was associated with a potential CME which will be analysed when further imagery becomes available. There are four further sunspot regions on the visible disc, with all of these simple and benign. No CMEs were visible in available coronagraph imagery.

Solar Wind / Geomagnetic Activity: Solar wind speeds have averaged between 550-600km/s over the last 24 hours, as the Earth continues to be affected by the high speed stream from coronal holes 10 and 12. Density has been around average. Total magnetic field strength was weak, with the north-south component, Bz, also varying weakly. Phi angle has been positive (away from the Sun) throughout the period. Geomagnetic activity was Quiet to Unsettled (Kp 2 to 3).

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV), as measured by GOES16, was at background levels. The high energy electron flux (greater than 2 MeV) has been at high levels throughout, with a peak of 7.46pfu at 11/1150UTC. The 24-hour integrated electron fluence initially followed an upward trend, with 3.21e8 integrated pfu observed at 11/0000UTC, but has since steadily declined.

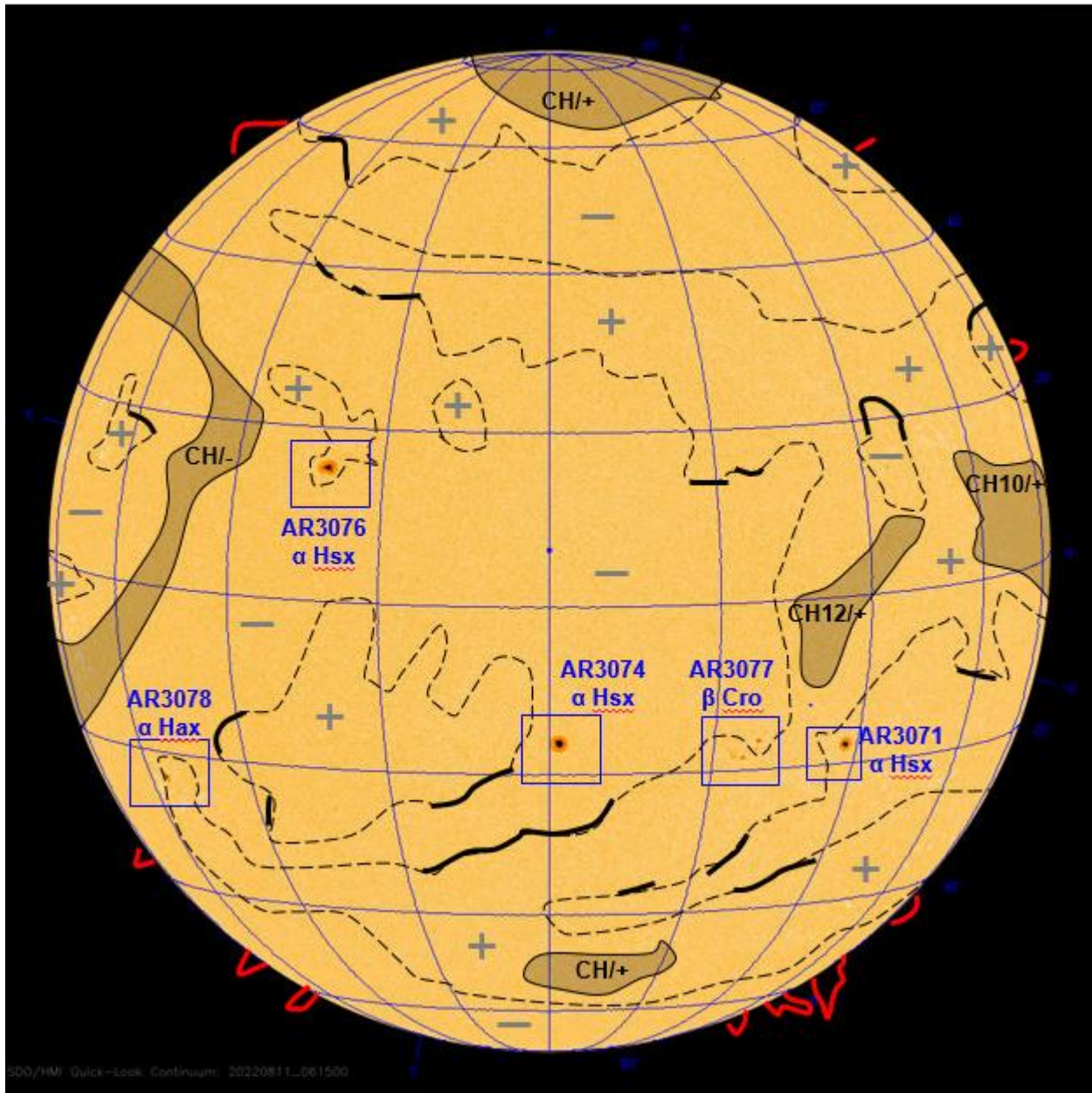
Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is likely to be Very Low or Low, with a likelihood of C-class flares.

Solar Wind / Geomagnetic Activity: No CMEs feature in the current forecast. Solar wind speeds are expected to average between 500-600km/s through the next two days, due to coronal hole high speed streams. Winds are then likely to decline towards background levels on 13 and 14 August. Geomagnetic activity is forecast to be mainly Quiet to Unsettled, but with a slight chance of Active or G1/Minor Storm intervals in 11 and 12 August. A return to mainly Quiet conditions is then likely from 13 August.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) is expected to remain at Background levels. High energy electron flux is expected to remain above the high (1e3 pfu) threshold through much of the period. Electron fluence is also expected to remain above the Active (1e8 integrated pfu) threshold.

Figure 1. Solar Analysis Valid 11/0800 UTC .



Key: Filament ____, Prominence ____, Magnetic Field Line - - -, Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.



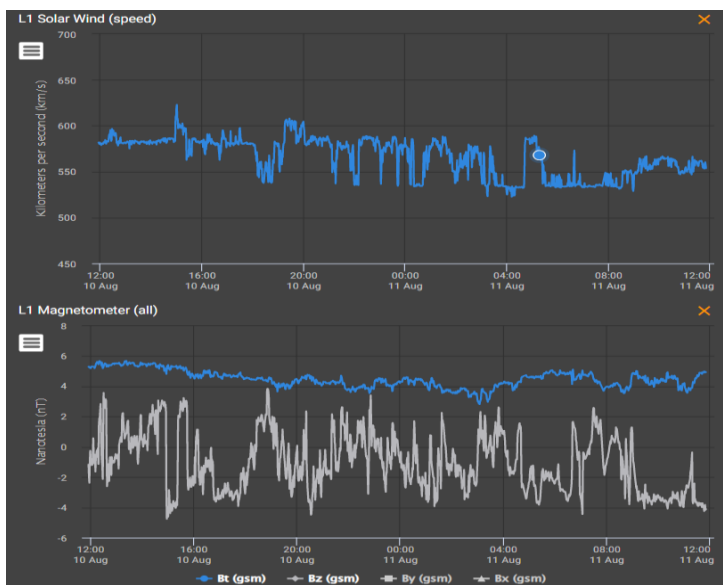
Geomagnetic Storms:

No CMEs are currently forecast, but the feature lifting off from the region of AR3077 will be analysed when more imagery becomes available.

Solar winds are expected to remain elevated through 11 August and into 12 August due a combination of high speeds streams from coronal hole 10 and corona hole 12, the latter which is likely to have connected on 10 August. Speeds from these features are around 500-600km/s. A decline in speeds is then expected from either late on 12 or 13 August. STEREO-A is indicating an increase in solar wind speeds and a brief peak in density which could affect Earth on 12 August, although this may be a transient CME which arrived at STEREO-A and not Earth. Geomagnetic activity is forecast to be mainly Quiet to Unsettled, but with a slight chance of Active or G1/Minor Storm intervals in 11 and 12 August. A return to mainly Quiet conditions is then likely from 13 August.

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	10	5	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: DSCOVR observations at L1 for last 24 hours



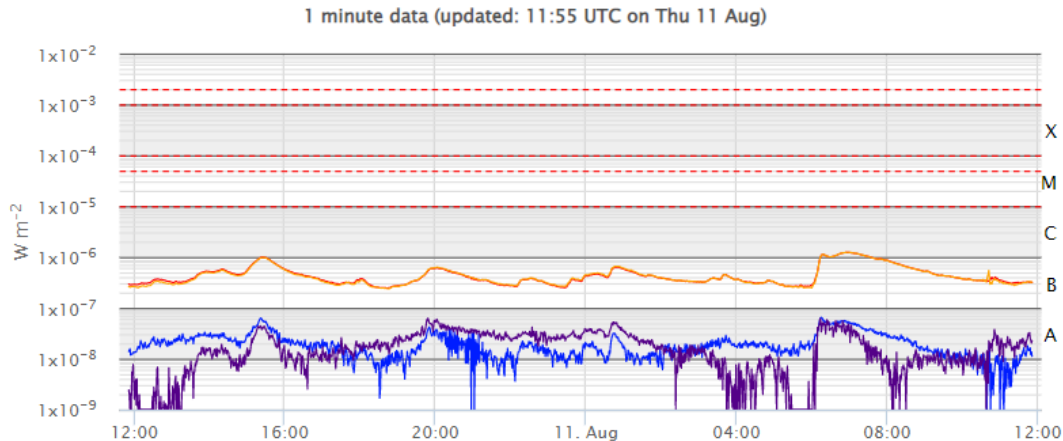
Radio Blackouts - X-Ray Flares:

Solar activity is expected to continue to be Low or Very Low in the absence of significant sunspot configurations. AR3077 (Cro/Beta) is the most notable region on the disc, producing the only C-class flare of the previous 24 hours, but appears to be fading.

A number of returning regions may rotate onto the visible disc in the next 24 hours, with bright flux regions on STEREO-A EUVI imagery potentially indicative of an increase in solar activity.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	5	5	5	5
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: X-ray flares at GOES 16. The long period flare starting at around 11/0600 UTC was from AR3077.



Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) is currently at Background levels, and is expected remain at this level through the period barring development of significant sunspot regions.

Radiation Storms	Level ($\text{cm}^{-2}\text{sr}^{-1}\text{s}^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	$\geq \text{S1}$	No	1	1	1	1
Very Active	$\geq \text{S3}$ *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $\text{cm}^{-2}\text{sr}^{-1}\text{s}^{-1}$)

High Energy Electrons Event ($\geq 2\text{MeV}$):

Electron flux (greater than 2MeV) levels are likely to remain above the high ($1\text{e}3\text{pfu}$) threshold through much of the period due to the elevated solar wind and in the absence of any significant geomagnetic activity. Based on the absence of any phenomena which may modify the electron belts, any decrease is likely to be slow with only a very gradual decrease in electrons.

Electron fluence values are expected to remain above the Active ($1\text{e}8$ integrated pfu) through the next three days, excluding any geomagnetic storming, with a likelihood of remaining above the threshold on 14 August. There is a very slight chance that the electron fluence could peak at above the Very Active ($1\text{e}9$ integrated pfu) threshold on 12 August, but this is considered to be a very low risk.

GEO Electron Environment	Level ($\text{cm}^{-2} \text{sr}^{-1} \text{day}^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	$\geq 2 \text{ MeV}$ $\geq 1 \times 10^8$	Yes	100	90	70	60
Very Active	$\geq 2 \text{ MeV}$ $\geq 1 \times 10^9$	No	1	5	1	1

Figure 4: GOES 16 Electron flux and MOSWOC REFM fluence model

